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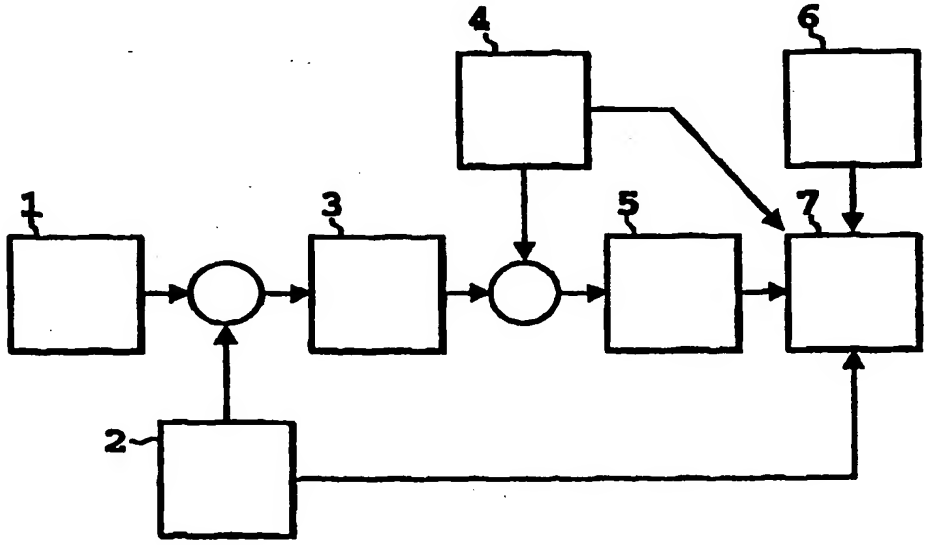

(57) Abstract

An elevator control system in which the elevator motor is a synchronous motor fed by a frequency converter. The elevator control system comprises a model (3) of the mechanical system, which is divided into a static part (1) and a variable part (2) dependent on load weight data, means for giving a speed and/or position reference (4), means for calculating the motor torque and speed requirements (5) on the basis of the model of the mechanical system and the speed and/or position reference (4), a parametrised model (6) of the motor, means for calculating the motor control quantities (7) on the basis of the parametrised model of the motor and the torque and speed requirements (5).

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ELEVATOR CONTROL SYSTEM FOR SYNCHRONOUS MOTOR

The present invention relates to an elevator control system as defined in the preamble of claim 1.

Finnish patent application FI A 944583 presents a solution according to which an elevator drive machine using a synchronous motor can in principle be started on the basis of all data defined in any case in the elevator or in its machinery. For example, the load weight signal is always available because of other requirements regarding elevator load data, such as overload data.

The object of the present invention is to disclose a new type of system for controlling an elevator drive machine using a synchronous motor. Specifically, the invention discloses a new type of system that reduces the costs involved in elevator control.

As for the features characteristic of the invention, reference is made to the claims.

The system of the invention is used to control a synchronous elevator motor fed by a frequency converter. The system comprises a model of the mechanical system, which is divided into a static part and a variable part dependent on load weight data. The motor torque and speed requirements are calculated according to the mechanical system model as well as according to a speed reference and/or position reference. The system also comprises a parametrised model of the motor. In principle, the only variable in the system is the load weight data, everything else is known in advance. In the system, the motor control quantities are calculated on the basis of the parametrised motor model and the torque and speed requirements. Thus, the entire elevator movement along its route from the starting acceleration to the final stop is defined

and translated into motor control quantities prior to the departure of the elevator.

In a preferred embodiment of the invention, the models comprised in the control system, the model of the mechanical system or the parametrised motor model, are supplied from outside the control system. Therefore, the models are known beforehand from some other context.

In a preferred embodiment of the invention, if the models are not known beforehand, or if e.g. their reliability is to be verified, then the models can be generated on the basis of measurement results obtained from test operation executed by the control system.

In a preferred embodiment of the invention, the system measures the load weight data continuously. This load weight data can be utilised e.g. in control system stabilisation during elevator travel.

As compared with prior art, the advantages of the present invention include a small need for measurements as the only quantity to be measured is the load weight data. The mass of the system remains substantially constant after the elevator doors have been closed, so the weighing only needs to be carried out at least once during each passage of the elevator. Another consequence of the system is a simple structure. As a result of these facts, an elevator implementation according to the system of the invention is economical as compared with prior art.

In the following, the invention will be described by the aid of a few examples of its embodiments by referring to the attached drawing, which presents a block diagram representing the system of the invention.

The mechanical system 3 of the elevator system is divided into two parts, a static part 1 and a variable part 2 dependent on the load weight data. The static part 1 practically remains constant all the time. Its parameters include e.g. the mass of the elevator car and that of the counterweight as well as the frictional forces. The variable part consists of the load of the elevator. The load weight data can be assumed to be constant from the moment the elevator doors are closed.

The speed reference is obtained e.g. on the basis of the motor power, which is known. The position reference is obtained from the desired travel between floors, e.g. in the form of user's selection via the push-button panel of the elevator. Based on the speed and/or position reference 4, the requirements regarding motor torque and speed can be calculated. When this information is combined with the parametrised model 6 of the motor, the motor control quantities 7 to be used can be calculated in advance. As the synchronous motor faithfully follows the control signal supplied by the frequency converter, the system calculates all the motor control quantities to be used during the passage of the elevator along its route even before the elevator car starts out. The motor control quantities include e.g. the angle of the magnetic field of the stator and the current to be supplied to the motor. The control quantities are stored in memory and fed to the motor in sequence at specified points of time, with the result that the elevator executes the functions comprised in the model provided in the system.

The invention is not restricted to the examples of its embodiments described above, but many variations are possible within the scope of the inventive idea defined by the claims.

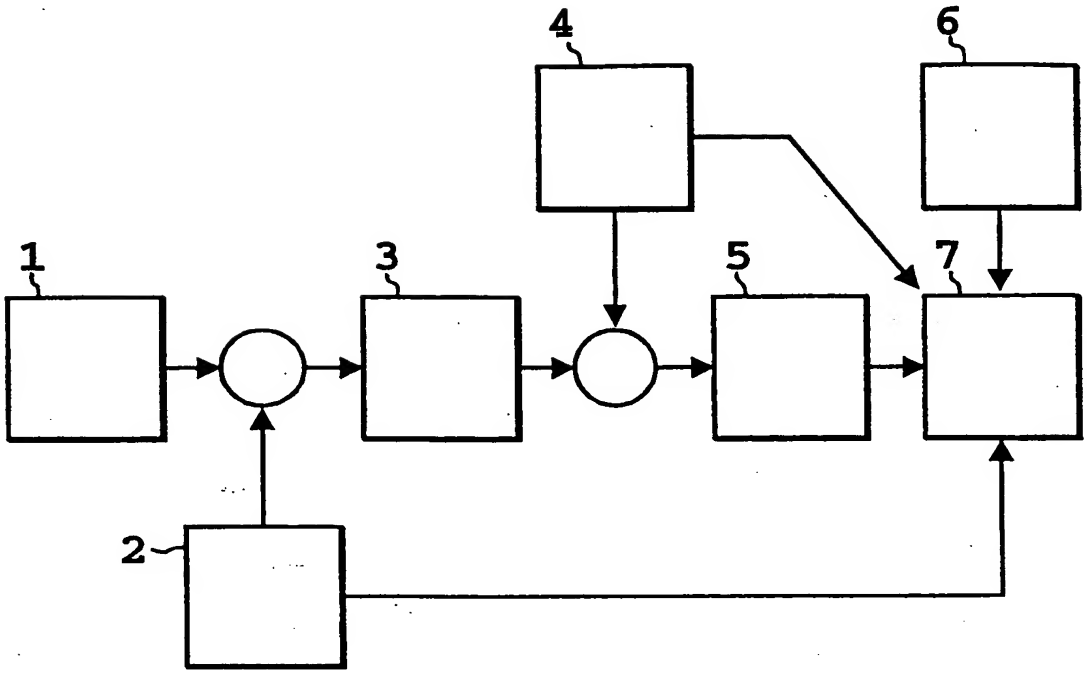
CLAIMS

1. Elevator control system designed to control a synchronous motor fed by a frequency converter, **characterised** in that the control system comprises
- a model (3) of the mechanical system, comprising a static part (1) and a variable part (2) dependent on load weight data,
- means for giving a speed and/or position reference (4),
- means for calculating the motor torque and speed requirements (5) on the basis of the model (3) of the mechanical system and the speed and/or position reference (4),
- a parametrised model (6) of the motor,
- means for calculating the motor control quantities (7) on the basis of the parametrised model (6) of the motor and the torque and speed requirements (5), in which system the entire elevator movement along its route from start to initial acceleration, possible constant speed, final deceleration and stopping is defined and translated into motor control quantities.

2. System as defined in claim 1, **characterised** in that the models comprised in the control system are supplied into the system from outside as separate input data.

3. System as defined in claim 1, **characterised** in that the models comprised in the system are generated on the basis of measurements performed by the control system via test operation.

4. System as defined in claim 1, **characterised** in that the load weight data is measured continuously, providing feedback for control system stabilisation during elevator travel.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